# Environmental Restoration (ER) at Los Alamos

## Focus Areas

### Analysis and Assessment

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*Focus Area Leader*

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*Team Leaders*

We are responsible for developing the technical strategy and implementing consistent technical methodology across the ER Project. Our focus area includes three teams: Strategic Decision Analysis, Risk Assessment and Review, and Data Analysis and Assessment. We support the ER technical strategy, which includes strategic decision analysis, surface and subsurface fate and transport modeling, human health and ecological risk assessment, long-term environmental stewardship planning, and technical peer review. We are also establishing and maintaining data-quality and data-management requirements that will be incorporated into a new technical database.

Our focus area is piloting the new ER integrated technical strategy that incorporates (1) characterizing and assessing the nature, extent and migration pathways of potentially interacting contamination within watersheds (or aggregates therein) and (2) integrating risk-based corrective-action decisions, which take into account human-health based risks, ecological risks, and other regulatory considerations.

### Information Management

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The Information Management focus area was added to the ER Project Management Team in FY 2000, with the objective of bringing all the project databases, software and hardware functions, and data management activities under one management area.

Our mission is to develop an integrated system to capture, store, and retrieve ER Project scientific, engineering, and business information. We will use existing information management platforms and systems when feasible to ensure customer confidence in our ability to retrieve information. Our long-term objective is to ensure that ER Project information is captured, stored, and retrieved in a manner that accommodates our users, who will have confidence in the ability and quality of information retrieved.

We coordinate activities for six teams: Sample Management Office, Geographic Information Systems, Database Administration, Computer and Systems Support, Information Management Development, and Data Management Support (editing, validation, centralized data management).

### Canyons

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We evaluate the present-day human health and ecological risks from Laboratory-derived contaminants in the canyons system and assess future impacts from the transport of these contaminants through the canyons to areas outside the Laboratory. Our work includes sediment sampling, geomorphic mapping, and surface-water and alluvial groundwater investigations.

**Evaluating Sediment Contamination.** A variety of contaminants, including radionuclides, metals, and organic compounds, have been released from LANL activities into canyons below the Pajarito Plateau since 1943. Most of these contaminants tend to adsorb to sediments, and they have been redistributed in the canyons by floods. We have developed a method to evaluate this sediment contamination at watershed-scales. Our method includes general field studies (for example, mapping, radiation monitoring and x-ray fluorescence [XRF] measurements for barium) and sampling of a series of canyon reaches, which extend from the contaminant sources in the upper portions of the watersheds to the Rio Grande. In each reach, we begin with large-scale geomorphic mapping of post-1943 sediment deposits, focusing on variations in sediment age, thickness, and particle size distribution that control variations in contamination. Following

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the mapping, we sample multiple times in each reach to sequentially reduce uncertainties and focus data collection. In the first sampling phase, we collect a small number of samples and analyze them for an extensive suite of possible contaminants. We use a statistically based sample-allocation process to distribute samples in each reach to reduce uncertainties in total contaminant inventory. Our data on sediment age are being used to develop a time series of contaminant concentrations, which helps us define the effects of past floods on contamination and allows us to forecast future trends in contamination.

**Evaluating Surface Water and Alluvial Groundwater.** The hydrologic relation of surface water and alluvial groundwater within the alluvium-dominated canyons supports a characterization approach designed to enhance understanding of the hydrologic, geologic, and geochemical system. This approach couples the collection of data both temporally and spatially. Key data include water-level measurements from alluvial wells and documentation of surface water behavior related to meteorologic variability, field-measured water quality parameters, and laboratory results. These data are used to validate and refine a conceptual model for spatial and temporal variability in contamination, and they are then evaluated to determine if conditions pose unacceptable human-health or ecological risk.

We are conducting water-balance modeling to determine potential recharge areas and assess the long-term fate and transport of contaminants. We plan tracer studies using potassium bromide to determine large-scale groundwater flow paths and the travel and residence times for potential risk-driving contaminants. The results of these investigations will also provide the fundamental information to address potential remediation objectives.

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## Material Disposal Areas (MDAs)

*J. Hopkins (EES-9, johnhopkins@lanl.gov)*
*Focus Area Leader*

Between 1945 and 1985, radioactive and hazardous wastes were disposed of at various sites around the 43-square-mile Laboratory campus. Now called MDAs, these 26 sites are being investigated under the purview of the ER Project. The MDAs have various inventories, including liquids, sludges, solids, liquid and volatile organic chemicals, non-nuclear explosives residues, and radioactive compounds. We are characterizing each MDA and designing corrective actions so they can be closed in accordance with current regulations.

We are also responsible for ensuring that these 26 MDAs do not pose a future hazard to humans or the environment. To gather data for possible future risk assessments, we are collecting air, surface-soil, storm-water, drainage-sediment, pore-gas, and subsurface-tuff samples from around the MDAs, using nonintrusive sampling methods. We have avoided sampling within the MDAs because of possible risks to site workers, although at this time the risks are considered low.

Possible risks to workers could increase in the future if natural hydrogeological processes or other disruptive events disperse contamination. To mitigate any increased risk from MDAs in the future, we are evaluating alternative strategies for final closure. Some options being considered are stabilizing some of the contamination in the MDA before constructing a final cover, varying cover thickness, using biotic barriers to prevent plant and animal intrusion, controlling access to the MDAs, and/or monitoring environmental media to ensure that contamination is not transported.

The Resource Conservation and Recovery Act Facility Investigations (RFIs) for MDAs G, H, and L at Technical Area 54 were completed in 1999. The RFI Report for MDA H will be completed in 2001 and the RFI Report for MDAs G

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and L will be completed in 2002. Design and construction activities in conjunction with remediating these MDAs will start shortly after public input is completed and a permit is modified.

**Clean Closure Project.** The objective of the MDA P Clean Closure Project is to remove and dispose of the Laboratory's 50,000-cubic-yard hazardous-waste landfill, under the provisions of Resource Conservation and Recovery Act. This seven-acre site is located at the TA-16 Burning Grounds in the southwestern area of the Laboratory. Between 1950 and 1984, high-explosive contaminated materials were burned at this site, and the rubble and debris were then pushed into the landfill. This closure project will be conducted in four phases: (1) excavation, segregation, treatment and disposal of all contaminated material from the landfill; (2) confirmatory sampling and analysis; (3) acceptance by New Mexico Environment Department of an independent report confirming clean closure; (4) stabilization and revegetation of the site.

The original MDA P Clean Closure plan was approved by the New Mexico Environment Department in February 1997. In the fall of 1997, the excavation contractor encountered detonable high explosives in test pits in the east lobe of the landfill, and all work was stopped. We revised the closure implementation plan so that excavation would be conducted remotely, and the high explosives would be removed by trained explosives ordnance technicians. The contractor began excavation again in February 1999, and it was completed in December 2000. Just over 51,500 cubic yards of soil and debris were excavated. We expect that disposal of the waste will be completed by June 2001. Confirmatory sampling will begin in May, and we will submit a final report confirming closure to the New Mexico Environment Department when the sampling is completed. As soon as the report is approved, the site will be recontoured and revegetated.

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## Modeling

### 3-D Geologic Model of the LANL Site and the Española Basin

*J. W. Carey (bcarey@lanl.gov) and G. Cole (EES-6)*

The ER Project and Groundwater Protection Program are responsible for gauging the potential for migration of contaminants from various sites around the Laboratory. To enhance their understanding of this process, we are generating a geologic model of the area at two scales: Laboratory (138 square miles) and Española basin (2,500 square miles). At the Laboratory scale, the model will serve as a framework for detailed studies of the fate of contaminants such as in the Los Alamos Canyon region. At the Española Basin scale, the model will help interpret transport pathways through the regional groundwater table.

Our models, assembled from geologic maps, borehole data, high-resolution total station mapping, and interpretative cross-sections, are managed using Oracle. We use geographic information software (Arc/Info) to assemble the various data sources and to generate gridded surfaces representing geologic unit boundaries; using petroleum industry software (Stratamodel), we assemble these surfaces into 3-D geologic models. At present, the 3-D geologic models are built into 30 geologic units, from approximately 50,000 data records. The geology ranges from Precambrian basement to recent ash-flow tuffs to localized basalt flows. These models embed all of the spatial relations of the actual geology and can be used to generate geologic maps, cross sections, and similar materials, and they will be the framework for numerical models of hydrologic and contaminant transport processes.